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## ON SLATE AND SLATE QUARRIES.

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## CHAPTER II.—GEOLOGY OF THE SLATE ROCKS.

It is, of course, necessary to bear in mind that the solid substances forming the crust of the earth possess a certain order of superposition, and are divisible into stages or groups, which are distinguished by differences of mineral structure and contained fossils. Each of these stages is, for the sake of convenience, styled a formation. The only theory implied is that the formations were successive, which the mode of their occurrence distinctly proves.

Just as various articles of manufacture have derived permanent names from the places where they were first fabricated, so in geology the strata have acquired names founded on the geography of the district where they were first ascertained or described.

The principal slate-bearing rocks throughout the world are now designated as Cambrian, or Silurian; the subdivisions, as Bangor, Tremadoc, Llandeilo, Caradoc, Bala, Llandovery, Wenlock, Ludlow, &c. Of course, all such divisions and groupings are to a certain extent purely arbitrary, but they are grounded in nature. The divisional lines are not of equal value. Between some of the formations there occur actual physical breaks in the order of things, indicated by unconformity in direction, or by total change of mineral constituents, or by difference in the character of the organic remains.

The old theory that granite is the oldest of all rocks cannot any longer be sustained. Granite and its allies have been the great operators, but the materials operated upon are the oldest things we can see. Gneiss, mica-slate, and altered rocks lie at the base of the great slate-bearing strata. In them we lose the clue to any earlier successions. They contain indications of pre-existing materials; more than this we cannot at present pronounce.

Slate rocks belong to the sedimentary series. Fifty years ago the whole of these, beneath the coal, were divided into clay-slate and grauwacke. In a work which was in many points in advance of its age—Phillips's *Geology of England and Wales*, 1818—the description given is as follows: "The prevailing rocks of North Wales are slates of various descriptions. Its mountain ranges consist, in great measure of trap-rocks, with which slates are associated, and even in some places interstratified." The subsequent labours of Sedgwick and Murchison, and of the Government surveyors, have added new domains of knowledge, by their continuous investigations in these apparently unpromising regions.

The lowest rocks in which we can trace any phenomena of succession are evidently derived from the ruins of structures now unknown to us, save in this second-hand relation. Prof. Ramsay, writing of these lowest beds in Wales, says: "The vast thickness of the Cambrian rocks of Merionethshire and Carnarvonshire tells of the waste of a great territory by which the sediments were formed; and, further, the country from which the pebbles in this conglomerate were derived must have resembled in some respects North Wales as it now stands, but except in those pebbles no trace of land remains."

These sedimentary rocks have been augmented in volume, and changed in structure, by matter from a different source—namely, by substances of an eruptive origin, which have not only added to their bulk for crystallisation, but effected chemical and mechanical changes by heat and pressure. These substances, in the mass, are styled trappean.

Our object has to do with both these classes of rocks, but in totally different ways. Strata have been formed from pre-existing materials, as a deposit from water holding them principally in mechanical suspension, and partly in solution. The trappean rocks and volcanic energy have acted as factors, contributing some materials to the mass of sediment while moist, but chiefly acting by forces applied after deposition and desiccation.

Ranging in order of succession upwards, the different groups of sedimentary rocks with which our subject has to do are:—

- 1.—Lower Laurentian .... Not in Britain.
- 2.—Upper Laurentian .... Gneiss of North-West of Scotland. In a bed of limestone of this age a fossil zoophite (*Eozoon Canadense*) has been ascertained.
- 3.—Lower Cambrian..... Bangor and Llanberis—Barlech rocks. The Longmynd. Primordial zone of continental geologists.
- 4.—Upper Cambrian..... Festiniog slates. Tremadoc slates. Lingula beds.
- 5.—Lower Silurian..... Taranon shale. Denbighshire grits, with slates at Llangollen and Llandderfel.
- 6.—Upper Silurian..... Wenlock series. Lower and Upper Ludlow.
- 7.—Lower Devonian..... Dolabole slates.
- 8.—Middle Devonian..... Plymouth sandstones and slaty rocks.
- 9.—Upper Devonian..... Shales of Irish carboniferous slate.
- 10.—Coal shales and grits of lower coal measures.
- 11.—Slates in collieries of Stonesfield and Collyweston.

NOTE.—The formations above the Devonian cannot with propriety be termed slate-bearing rocks. Fissile stone occurs, but not perfected slaty structure.

It will be necessary to describe more fully a few of the great divisions indicated in this table, and as North Wales affords the best known, and probably the best illustration, of the slate series, we shall principally confine our attention to this district.

Practically the slate rocks of North Wales may, for our present purpose, be divided into five ascending groups. The Penrhyn and Llanberis system, called Lower Cambrian No. 3 of our scale; overlaid by the Festiniog or Lingula system, No. 4; overlaid by the Llangollen slate, a portion of the Upper Silurian. The Lower Silurians do not appear to be productive of slate in Wales, but at Angers, in France, they are the chief deposits. An ordinary geological map, especially the beautiful maps of the English Government Geological Survey, will show the existence and spread of these rocks where they occur. Geological maps of all countries exhibit divisions similar, so far as they go, to those of our own land, and the names given here have been, for the most part, accepted as universal terms.

The characters serving to unite the great rock masses into groups are of various kinds, the unity is established not always by one and the same characteristic, but is the sum of the whole. Mineral structure may be the same or different, fossils absent or present, superposition clear or obscure, but from the evidence of all kinds obtainable, skilled judges determine the position in the geological scale of these great rock masses. We commence in Wales with:—

No. 3.—The Bangor slate rocks occupy the same position as those called Huronian, in Canada, the same as the siliceous sandstones of Brittany, and the primordial zone of Bohemia. In North Wales this division is about 3000 ft. thick, and is composed of slates, sandstones, and volcanic matter. The veins of slate, though persistent in long courses, vary in size and composition. The whole of these

sedimentary matters, in the form of solid rock, display the same kind of changes which we see on a sea-beach at present. Miles of mud surface, varying in depth, graduate into sand, succeeded by shingle, all on the same level. For quarrying purposes slate is sufficiently persistent to repay its continuous pursuit when once found, but when followed on the line of strike for miles it is quite possible that the vein (as the bed is then called) may have so altered in its mineral constituents, or in superinduced structure, as to be economically worthless. No safe conclusion can be drawn respecting the profitability of a quarry, merely because it is on the same vein or line with another and profitable work.

In these Lower Cambrian rocks the cleavage is often very marked. It is so intense in the valleys of Nant Francon (Bethesda) and Llanberis, that it is extremely difficult there to detect the line of original bedding. The vein is the same in the Llanberis as in the Penrhyn quarries; the same number of slate beds are in each, with the same direction. The blue slate evidently continues from each far towards the other.

No. 4.—Near the top of the passes in which the great old quarries occur lie in ascending order the grits and ferruginous slates of the Lingula flag series. These are 2000 feet thick in Carnarvonshire, but deepen to 6000 feet in Merionethshire, where they include the valuable slate beds around the Vale of Festiniog. This great deposit has been well divided into three stages. The lowest of these includes the strata forming the base of Cader Idris, micaceous flagstones, with some beds of slate, occasionally showing marks of the characteristic fossil *Lingula Davisii*. Prof. Ramsay says, with reference to the district in Merionethshire lying around Cader Idris, that "the rocks are intermingled with bands of dark earthy and very pyritous slate, affording an inferior roofing slate, that has been quarried, often with little profit. The minute interstratifications of silicious and felspathic and aluminous matter in the banded beds seems to have debarred the development of a close and regular cleavage, and the decomposition of the iron pyrites, in which they abound, causes the lamina to scale off, and injures the quality of the slate."\*

Conformably above these are the Tremadoc slates, having a thickness of about 2000 feet, containing some slate beds, but no long-established quarries.

The works now undertaken at Hendol and elsewhere, on the south side of Barmouth estuary, on the coast, are apparently in the Tremadoc slate series. The slate is both fine and strong. There is an evident mixture of trappean matter, and very good cleavage.

ISLE OF MAN.—Along the coast from Douglas, north-eastward, the strata appear in the form of thin-bedded grey flags, having the mineral character of the Skiddaw slate, and dipping south at an angle of 60°. These thin-bedded strata on passing downwards become thick-bedded. The finer strata, having a distinct cleavage, are to some extent used for slating.† The hills immediately south of Souby, 4½ miles west of Ramsey, have a distinct slaty nature, and the slates have been worked for roofing purposes.‡ These rocks are considered to belong to the Skiddaw slate series, and to this, of course, belongs the typical slate-bearing region of Cumberland.

No. 5.—Lower Silurian. These are in Wales barren of good slates. They are divisible into the Llandeilo rocks, about 1500 feet thick, underlying the Bala and Caradoc series, about 1200 feet thick.

In the large mass of the lowest Silurian in the South of Scotland, in Dumfriesshire, and the adjacent district, cleavage is very imperfectly manifested, and consequently there are no slate quarries. Prof. Harkness accounts for this by the statement that the great mass of the strata which make up the Silurians of this part of Scotland are of an arenaceous nature; a composition which is not so susceptible of being impressed with cleavage as argillaceous deposits.§ In these deposits there are markings which indicate that similar physical conditions to the present prevailed at the inconceivably remote epoch when they were formed. There are cracks from rapid drying of the mud, traces of small current drainage on a shelving shore, proofs of shallow water, and tracts of some small crustacean creatures.

There are cleaved slate rocks in Ireland, and slate rocks in county Wicklow; at the Devil's Glen, in the Cambrian formation; and in the Lower Silurian, counties Dublin and Kildare.

The Lower Silurians on the lower Loire, at Angers, and thence on to Brittany, yield very excellent slate.

No. 7.—The only portion of the Upper Silurian which is quarried for slate is that which is termed the Denbighshire grits, occurring in force near Llangollen. On the whole, it is a mass of coarse rocks, which in some places contain truly cleaved good slate, and in others uncleaved flagstones of useful quality for manufacturing purposes.

Nos. 8, 9, 10.—The Devonian system is the name given to a large development of imperfectly slaty rocks, with accompanying limestone grits and shales, which occupies a place between the Silurian below and the coal measures above, on a parallel in some parts with the Old Red Sandstone, of which it is, probably, the marine equivalent. The Old Red proper contains traces of fresh-water deposits. It bears no slate, and is only connected with our subject by a few runs of tilestones, locally used for coarse roofing and slabs. The principal slate veins in the Devonian series are in the lower portions of the Upper Devonian; the hard rocks, worked at Delabole, Tintagel, and elsewhere, along a limited line of country in the north of Cornwall. The produce is a good crystalline slate, of fine greyish green colour, with metallic ring. The veins of slate bear a very inconsiderable ratio to the thickness of the beds, and there is a very great overburden at all the quarries.

The Devonians yield slate in Rhenish Prussia. They are worked at the Magog Works, near Friedeburg, at the Neckar Quarries, near Merched, near Wittgenstein, near Coblenz, Caub, and Giessen. Roofing slates as well as slabs are obtained in sufficient quantities for the supply of a considerable local demand. The Caub slates are in the lower bands of the upper Devonian (Orthoceras slates), probably on the geological level with the Tintagel slates.

No. 11.—Carboniferous system. The lower coal measures, comprising a thick series of grit and shale, often puts on slaty structure. In the South of Ireland a portion of it has been named carboniferous slate. In Devonshire quarries have been opened along the lower edge of the formation as it mantles round Dartmoor, but the waste, and the presence of pyrites and decomposing earths, have prevented extensive success. Experience teaches that such sources are useful only for the supply of local demand, when it may be effected with-

out great expense of plant. The slate is too uncrystalline, uncertain in its preservation, and heavy. The imperfect roofing slates quarried on the banks of the Sichen, near Vichey, were determined by Sir Roderick Murchison to be of carboniferous age.\* They are economically inconsiderable.

Slates of this description are frequently opened on and quarried at a considerable expense, in the hope that the vein will lose its earthy and pyritous character in depth. But this is a delusive expectation. The decomposition of the pyrites on exposure bursts the laminae asunder, and ruins the slate. It would appear that the slaty rocks become more pyritiferous as the scale ascends, for the black slate of the culm measures contains more pyrites than the Devonian slates, and the Llangollen more than the Llanberis. When, however, pyrites occurs in the form of compact cubes in hard rocks it does not weaken the slate, but only renders it difficult of manufacture, inasmuch as it injures the tools.

Both roofing slate and slabs are obtained from the dark beds at the very base of the culm or carboniferous system in North Cornwall. A line drawn from St. Gennys, on the coast southwards to Plymouth, curving round the south-western part of Dartmoor, is the strike of the carboniferous beds; the slate vein is quite at the base, opened on in various places, but with indifferent success. The cleavage is at a slight angle. There is much dark carbonaceous matter mixed with the slate; the roofing is heavy, and apt to split on exposure; the flooring is good, especially for in-door work. The best quarry is situated close to Launceston, and called the Alexandra Quarry. The stone abounds in vegetable impressions of lower coal measure plants, much comminuted. Further south, in a little quarry near Resare, the stone shows bellerophon and goniatites.

No. 12.—Oolites. A strong fissile layer occurs at the base of the Bath stone series, which, being principally developed and worked at Stonesfield, near Blenheim, in Oxfordshire, is called Stonesfield slate. The bed of slate, though not exceeding 6 ft. in thickness, is of considerable value for local purposes. It may be seen on cottages, halls, churches, and houses throughout Oxfordshire. After the stone is raised it is exposed to the action of frost, and thus divided into plates sufficiently thin for use. It is worked by shafts and galleries, at a depth of from 30 to 40 ft.

There are a few places among the Alps where the secondary rocks are so greatly metamorphosed as to yield slates. This is the case in quarries used for local supply on the shores of the lake of Thun, and at the summit of the Allée Blanche, near Courmayeur, and in some other places. The true slate-bearing rocks have not been detected on the surface in the Central or Western Alps, but in the Eastern chain and in the Tyrol there is much clay-slate and metamorphosed rock, in connection with the Silurian and Devonian strata, which yields grey and green slates.

TRAPPEAN ROCKS.—It might be supposed that a description of the sedimentary rocks in which slate veins are found, and of the force by which their distinguishing structure has been communicated to them, would exhaust all that it was needful to treat of respecting the geology of our subject. But this would be quite incomplete without some reference to a large series of rock masses, entirely different in their origin from the slate rocks, and yet having played such a part in their manufacture, so to speak, that no valuable slate is found out of the reach of their influence. These are the igneous substances termed trap, from the Swedish trappa (a stair), referring to the step-like form of their surface outline. They are of very various mineral constitution, which serves to classify them as greenstone (hornblende and felspar, or angite and felspar), basalt (compact felspar and angite), porphyry (crystals developed in an earthy base), lava, volcanic tuff and ash, &c.

Masses of this class of substances occur amidst the slate rocks everywhere. They are the ancient representations of phenomena which now take the form of simple volcanic ejections.

Trappean matter occurs either, first, in the form of huge mountain masses, as the Cuchullin hills, or smaller, lying as though forced up through the sedimentary strata; secondly, in dykes or veins vertical to the strata; thirdly, in sheets of matter interstratified with sedimentary rocks, as though it had been poured out over a floor of mud beneath the waters; or, fourthly, in the form of ashes mixed with mud, as though cinders and ash had been ejected, washed into mud from other sources, and afterwards consolidated into rock. In some places—for instance, the Arenigs—the outbursts of ashes and lava appear to have taken place almost simultaneously.

For analogies to these phenomena we must resort to the areas of volcanic disturbance. But the manifestation of these terrible forces amidst the slate rocks is on a scale far more gigantic than modern instances can show.

The action which produced from time to time, or rather from one long time-period to another, such enormous development of metamorphic and trappean rock in North Wales is wholly different from that of modern volcanoes in the extent and mode of its operation. The phenomena of the sudden formation of the island of Santorin must have been a thousand times repeated at once in the Palaeozoic ocean, the outflow of lava or volcanic matter was on a far grander scale than anything we now see going on; but the great distinctive feature in the old rocks is the intensity of action indicated, whereby the sedimentary strata became changed, fused, vitrified, crystallised over very large areas, so as to form mountain chains of half melted matter. We have the similar evidence of succession to that afforded by pebbles in a conglomerate bed, for the dykes of greenstone at Penrhyn contain fragments of cleaved slate torn off and embedded; so that the whole series of conditions, with their plutonic accompaniments, must have occurred and recurred over and over again, intercalated with marine life periods, during the building up of the old slate rocks. "At the very least," says Prof. Sedgwick, "99-100ths of the trappean rocks associated with the system of Cambria are contemporaneous."† Nor are proofs wanting of the contemporaneous violent action of water. The consolidated surfaces have been planed down or eroded and denuded. Each set of beds has its own system of valleys. The mind is strained in the endeavour to apprehend the outline of the great facts of physical history thus recorded in abiding characters.

Prof. Ramsay observes that, in the Festiniog quarries, interrupted bands of grey greenstone pierce the slates in a remarkable manner, sometimes seeming to lie between the beds, sometimes between the planes of cleavage, and often coinciding with neither. So in the Penrhyn quarries the strata are intercalated with trappean rock. One

\* Page 28.

† Prof. Harkness, Quarterly Journal Geological Society, vol. 22, p. 458.

‡ Ibid, page 490.

§ Harkness, Lowest Rocks of Eakdale, Quarterly Journal Geological Society, vol. 12, page 241.

\* Quarterly Journal Geological Society, vol. 6, p. 15.

† Quarterly Journal Geological Society, vol. 8, p. 135.



striking needle of this hard substance has been allowed to remain in the midst of the old workings, a kind of rude obelisk, perforated by the eyelet-hole of a former gallery. It stands as if mourning its lost supporters. In the working at Hendol, near Barmouth, there is a similar display of strong interbedded trappean rock, and so in many other quarries when the workings have disclosed the lay and composition of the rocks. The greenstone, in some of these cases where it is intrusive or posterior to the slate, is of later date than the cleavage. It is so at Lanberis, for the porphyries have caught up and surrounded fragments of cleaved slates. Contact with these trappean rocks, especially greenstone, renders the slate porcellanous, unfit for quarrying, and spotted with flinty matter.

The trap of the Berwyn is chiefly in the form of greenstone veins, running with the strike of the rocks, and for the most part interbedded with the latter. The good slate in the few places where it is found occurs in the neighbourhood of these trappean products. In the older region of Snowdon the Bala fossiliferous strata are overlaid by a vast series of volcanic productions, comprising alternations of greenstone, porphyry, volcanic grit, and volcanic ash. The peak of Snowdon is ash. The fine sections in the heights surrounding Llyn Lludaw, and elsewhere, exposed around the centre of the mountain, furnish an admirable picture of old volcanic accumulations. In the Festiniog country the huge developments of trap rocks were evidently contemporaneous with the slates. The existence of syenite, grit, and ash-beds attest the convulsions which accompanied some periods during the deposition of the Lingula beds. So numerous are these intrusions in parts of the series that between Barmouth and Rhaidir Maiddach the Lingula beds, says Prof. Ramsay, are penetrated by more than 150 greenstone dykes, varying from a few yards to nearly a mile in thickness. The pierced rocks are often slightly bleached or hardened at the point of contact. As may be anticipated, the alteration is on the floor of the vein, and not in the hanging wall. The trap must have cooled and become consolidated before the deposition of sediment was resumed. In the older Cambrian similar features occur, but with wider extension. As a general rule, the development of igneous rocks is proportionably increased according to the relative age of the formation. The Palaeozoic spaces on geological maps are usually scored and spotted with marks of the fiery flood. The Devonian rocks have been much disturbed by trappean agencies.

It will be seen from the foregoing sketch that the slate-bearing rocks, by way of eminence, are the strata older in the geological scale than the coal measures; and that of those the older, the Cambrian, contain the largest quarries—Penrhyn and Llanberis—whilst the next oldest, Lower Silurian—displays the greatest number of quarries, the Festiniog group. The proportion of cleaved rock to the general mass appears in Wales to attain its maximum in the Lower Silurian strata. Cleavage is less displayed in the ascending series, though still very considerable in a portion of the Upper Silurians, and in a less portion of the overlying Devonian rocks. It is only an occasional phenomena in the rocks above these. This is quite analogous to the deposition of coal, and of some other important minerals. They occur in preponderating mass on one great horizon of the earth's history, though not absolutely unknown at others. Causes in operation from the first did at one epoch display great intensity and continuity, after which they did not die out, but remained operative with a thousand others in framing and forming the present crust of the earth, over treasures of garnered riches which previous power had laid up in store.

#### THE CHANNEL BRIDGE.

This project, which from the first has been prominently noticed in the *Mining Journal*, is gradually gaining ground in this country, in which it is naturally difficult for a foreigner to find support. It is a testimony to its merits that notwithstanding such a disadvantage it has continued to make progress here. A report has been recently made by Capt. TYLER on the subject of the Channel passage, which states, in reference to Mr. BOUTET's project, that it is one which "has of late made the most progress." Capt. TYLER, of course, cannot pronounce any positive opinion in favour of its practicability, which remains still to be shown in this country, but pending the experiments now in progress, the results of which we have from time to time recorded, it is obvious that there must be great merit in Mr. BOUTET's design, and whether it is capable of attaining as wide a span as that proposed by its author or not, there is little doubt that it involves engineering improvements of the greatest importance, else it would not have attracted the attention of the EMPEROR of the FRENCH, and of such men as General FAVE (chief of the principal engineering college in France), of Marshal VAILLANT, the Minister of the EMPEROR's household, and of the fine arts in Paris, and of influential professional and other supporters.

Mr. BOUTET's bridge being designed to be constructed of wire-ropes and iron, is fraught with important advantages to the iron trade of this country, and for that reason, irrespective of the universal interest which attaches to the subject generally, is worthy the particular attention of the readers of the *Journal*. What Capt. TYLER says of its present position is:—

"In the case of Mr. BOUTET's bridge scheme, an association has been formed for making experiments. Two small bridges have been built in France, and arrangements are made near St. Malo for a third, a mile in length, to be constructed in two spans of half-a-mile each. The EMPEROR NAPOLEON visited the works of Mr. BOUTET, on a site which has been granted by the French Government, on the 8th inst., and His MAJESTY is stated to have expressed himself favourably with regard to the project. The bridge is intended to cross from Dover to Blancnez, and is advocated in a paper forwarded on June 27 to the Board of Trade, as (1) being less costly than a tunnel, (2) occupying less time in construction, (3) giving no trouble in ventilation, and (4) avoiding the danger of sudden inundations."

The fact that it should be thought capable of attaining a span of half-a-mile at St. Malo is a strong proof of its merit and capability for the Channel Bridge.

This report is made in pursuance of directions from the Board of Trade, to whom a deputation of most influential English noblemen and gentlemen recently represented that the French Government were waiting for the English Government to join them in guaranteeing an expenditure of 2,000,000*l.* for preliminary experiments in reference to the Channel passage. Capt. TYLER recommends that the whole matter should be now referred to the French Government, and what his report suggests for their consideration is an expenditure of 500,000*l.* for the improvement of Boulogne Harbour, because he estimates that 15 years must elapse before a continuous railway can be available for traffic; and he points out that the Council General of Mines in Paris, to whom the question of the Tunnel was last referred, concludes that "in the present state of things they would not form any estimate either of the probable duration of the works or their cost."

The French Council have no doubt exercised a prudent precaution in refusing to endorse the anticipations of the Tunnel promoters as to the duration and cost of such a work, the only two examples of under-water travelling, for comparison, being the Thames Tunnel, and the scarcely less notorious Whitehall Tunnel, under the Thames, both of which were less successful than was anticipated. The Mont Cenis Tunnel has far exceeded in cost and the time it has occupied the expectations of its promoters, and Mr. BIDDER, the most eminent authority on engineering calculations in this country, stated in his address to the Association of Engineers at Norwich that the Channel Tunnel would, in his opinion, take 45 years to complete, and cost 50,000,000*l.*

The proposed expenditure which Capt. TYLER suggests in the improvement of Boulogne Harbour, for the purpose of immediately relieving the inconveniences of the Channel passage by steamers, does not appear to be advantageous for this country, even if the French Government could be induced to incur such an expenditure as 500,000*l.* for what Capt. TYLER acknowledges would be only a temporary expedient, although it is true the sum he proposes to expend upon Dover Harbour for the same purpose is only 100,000*l.*

The improvement which Capt. TYLER recommends should be made at Boulogne with this 500,000*l.* consists of an extension of the west pier for 1000 yards. He states that the pier at Dover cost 1035*l.* a yard, and upon this he bases his calculation of 500,000*l.* He further states that Capt. CALVER has found, as the result of his soundings in 1865, that "A considerable deposit had taken place under cover of Dover pier." It is notorious that the French coast is much more liable to shoaling than the English coast, and if Dover pier has been damaged by this cause it is probable that Boulogne pier would suffer from it in a much greater degree, and that in a few years a further

extension of the pier would be necessary. Capt. TYLER approves of the rejection by the French engineers for this very reason of a scheme for projecting a similar structure at Cape Alfrech, to the west of Boulogne, which he states, "so far from preventing the accumulation at Boulogne appears rather to aid it," and he finds that in a similar situation at Dover "A gale of wind from the westward (which is the prevailing quarter) for two or three days would cause the shingle to form to a depth of 10 or 12 ft., and at times to block the harbour, and that sluicing for 10 years was attended with little or no benefit in removing this obstruction." He, therefore, reports "That it is by no means certain that a further projection at Cape Alfrech, or Portel, might not, instead of clearing away the accumulation in front of Boulogne, tend rather to increase it, and that the experiment would at least be very hazardous." If such an extension would be hazardous at Cape Alfrech, which is slightly to the west of Boulogne, how, it may be asked, can it be advisable to extend the west pier at Boulogne, as Capt. TYLER recommends.

Another objection raised to this recommendation is, that any plan for the improvement of the Channel passage should be based on the fact that it is continental traffic which it is sought to facilitate, and not the traffic to Paris only. Capt. TYLER states that—

"It must not be forgotten that while Boulogne forms the nearer route from London to Paris, Calais has the advantage of being a great centre of communication, via Brussels and Cologne for Strasburg, the Rhine, the North of Europe, and North and South Germany, and travellers proceeding in those directions would be taken much out of their course by steamers running to Boulogne."

The new harbour at Audresselles, which Mr. FOWLER proposes in connection with his proposition of a steam-ferry, is only 1½ leagues from Boulogne, and is, therefore, open to the same objection, which is a very serious one, when it is considered that Capt. TYLER states in his report the books of the London, Chatham, and Dover Railway Company, for the year ending Dec. 31, 1868, show that there were carried in that year by that company's boats, between Dover and Calais, altogether 133,670 passengers, of whom 77,443 were to or from Paris, or places beyond it, 39,547 were to or from Belgium and Germany, and 16,680 were booked locally between Dover and Calais, so that their destination was not known. They are, probably, the proportion of passengers who were waiting at Dover for fine weather to make the passage. It will be seen that it results from this that nearly half of the total continental traffic is not destined for Paris, and it may be presumed that such traffic would be taken out of its course by steamers running to Boulogne.

Capt. TYLER does not seem to be aware that if Mr. BOUTET's project is practicable, it is contemplated that his proposed Channel Bridge could be erected in three years, for 8,000,000*l.*

#### THE NEW ZEALAND IRON-SAND.

The smelting works in course of erection by Messrs. Henochsberg and Co., in Taranaki, for treating the valuable iron-sand found in that district are rapidly approaching completion. The works are situated on the Great South Road, and have the advantage of a river running through the grounds, the water of which will be used to drive a wheel, the power to be used instead of steam to work the fan. The furnace for smelting the iron-sand is being erected in a large building covered with corrugated iron, which stands by the road side; and from all appearance no money is being spared to make the furnace as perfect as possible. The foundation on which it is to be built is solid masonry, 8 ft. in depth, 7 ft. being underground. To make certain of its being secure, they sunk to the bed of the river to get a safe bottom. This basement is of octagon shape, about 14 ft. from side to side, in the centre of which the crucible is now in course of erection. The inside of the furnace will be egg-shaped, and the boss, or the widest part, will be 6 ft. in diameter. The height, from the bottom of the crucible to where it will be fed, is to be 20 ft., and the thickness about 3 ft. This part is all built of fire-bricks, cemented together by a concrete, composed of plumbago, fire-clay, and powdered fire-brick, which will be tied together by iron braces. At the bottom of the crucible there is an aperture for the metal to run from, and above it one for the slag to be drawn off. The crucible will hold about 2 tons of molten metal, and the blast will be conveyed through three blow-pipes, from 1½ to 2½ in. diameter, from an air-chamber, by a patent noiseless fan, driven by a water-wheel, which can be regulated to any power by stop-cocks. Mr. D. Atkinson has the management of erecting the furnace, and Mr. Birch is the contractor for building it. Upon a recent visit to the works of a number of gentlemen interested in the colony the process of smelting was shown. Mr. E. M. Smith, taking a packet of iron-sand, some Urenui clay, and some charcoal, and having mixed them well together in a mortar, put them into a small furnace he has erected in a workshop close by. In less than 20 minutes the metal was run out as liquid as water. The molten steel was then poured into a mould, and after the metal was cooled a little it was shown, by flattening the edge with a hammer, that although it was cast yet it was malleable, and also that it would take the most brilliant polish when burnished.

Perhaps the best proof which can be afforded of the purity of the Taranaki sand is, that these favourable results are obtained with the sand just as it is collected on the beach, and now that Mr. Henochsberg has taken the initiative, the practicability of turning the material to commercial advantage is beginning to be recognised, and capitalists in other parts of the colony are showing the disposition to assist, it being felt that the development of the Taranaki iron trade may have the effect of cementing the friendship between the two islands. Both the *Taranaki Herald* and the *Otago Daily Times* appear to take this view, the latter remarking that the establishment of works in the province of Taranaki for the purpose of turning to account the valuable Taranaki iron-sand is a subject of very considerable importance to the colony. "From a small beginning there is every reason to believe results of no little moment will follow. It need hardly be said that any source of wealth to the North Island which can be developed is an advantage as things stand at present to the South Island also. Whatever other objections may be urged against our political connection with the northern part of the colony, the expediency of the link is, after all, the prime mover of the agitation for separation which we have hitherto seen. So long as the present contrast between the contributions of the two islands to the general revenue, which is chiefly spent in the North, remains in force, so long will the people of the South have the strongest incentive that can be brought to bear on human beings to seek a division of the colony. Their pockets are injuriously affected by the union. Hence self-interest alone might lead us to congratulate ourselves on the commencement of a business such as the production of iron and steel in the North. The iron trade when once established is of more importance to any country than the most splendid yield of gold." One of the most valuable iron ores known in the world lies ready to hand, obtainable at a minimum of expense, on the shores of Taranaki. If the present experiment should succeed, as there seems to be every reason to suppose it will do, a most important addition to the exports of the colony will be secured.

Nor does the Government seem indisposed to render all the aid in its power, for the question of the "Iron-Sand Leases" has been most satisfactorily disposed of in the Provincial Council. On May 25, the Provincial Secretary moved—That this Council having taken into consideration the application made by Messrs. Henochsberg and Co. to his Honour the Superintendent, of May 11, that that portion of sea-beach between Waitara and Mimi, and also that portion of the Henni River, six miles in a south-west direction, be reserved from lease by any other person or persons for a period of nine months from date of application, is of opinion that it should be granted on the terms named. He spoke at some length on the enterprise exhibited by Messrs. Henochsberg in erecting a furnace for smelting the iron-sand, and said he felt sure the Council would not oppose the motion. Mr. Gledhill seconded the resolution, and dwelt on the advantages that would eventually be derived by the Province by the enterprise of this firm. The sum already spent in the erection of the present furnace was very large, and he thought the public opinion outside was in favour of assisting Messrs. Henochsberg in every way possible. The resolution was agreed to unanimously.

Such being the progress which has been already made by the colonist with their own unaided efforts, there can be little doubt that as soon as ample capital is brought to bear in establishing the iron manufacture in New Zealand, the Taranaki steel will take an enviable position in the markets of the world, and at the same time add much

to the wealth of the colony. The high quality of the metal produced is beyond question; and now that a means has been found of manufacturing it by an economic process, no doubt need be entertained of its becoming an established industry.

#### DRILLING AND BORING BY MACHINERY.

An improved drilling-machine has been invented by Mr. J. B. EVERARD, of Leicester; it consists of a cylinder with the necessary appurtenances mounted on a metal ring (the "inner ring"), on opposite sides of which pivots are fastened, working into bearings adjustable upon another ring (the "outer ring") of circular form, and arranged concentrically with the cylinder. By this method of mounting the cylinder may be inclined in any direction having a moderate divergence from the centre line of the machine. To the outer ring three metallic legs are fastened, these legs being in two parts, so as to be adjustable in length. Three properly shaped holes are drilled in suitable positions round the site of the proposed blast-hole, and a "Lewis" or other bolt inserted in each. The machine is then placed in the required position, and chains or ropes are stretched from the bolts to lugs fastened on the outer ring. The chains or ropes are tightened by means of ordinary right and left screw blocks. When the machine is used for drilling shot holes—that is, holes in large stones, it is attached by passing chains partly round and under the stone, and then tightening the same, as before mentioned. If required to be used as a tunnel or heading drill, it is necessary to attach the working parts to a suitable adjustable frame. The frame having been secured to the face of the rock, the exact direction of the holes is determined on, and the cylinder adjusted thereto, the toothed wheel bearing being similarly adjusted. The drill, which for a certain part of its length has keyholes formed in it at regular intervals, is dropped down the central hole of the piston-rod, and is keyed to the end of the screw shaft. The spring and wheel are then thrown out of gear by turning the rod a little on its hinge, and the screw is so adjusted that the point of the drill shall just touch the rock when the piston is at the end of its advance stroke. The steam is then turned on, and the continuous pressure under the piston drives it up. At the end of the stroke the valve is lifted, and the upper side of the piston opened to the steam-pipe, and it is driven to the bottom. In its descent or advance the main spring is forced by one of the teeth of the wheel past the end of the catch spring, where it remains locked until the catch spring comes in contact with the wheel, when it is released, and passing under a tooth is ready upon the return stroke to give the wheel a partial turn. This return stroke is produced by the opening of the exhaust port, when the action of the steam below the piston again drives it up, and the preceding operation is repeated. The wheel being partially turned gives a corresponding motion to the screw, which is thus fed forward, taking the drill with it. A spring pawl fastened to the fixed bearing prevents the return of the wheel. When the drill has penetrated to a certain depth the key is passed through a higher hole in the drill-rod; or, if necessary, a new drill is inserted, and the screw adjusted as before, when a similar action takes place.

#### STONE DRESSING BY MACHINERY.

An illustrated description of an improved stone-dressing machine, invented by Mr. J. E. Holmes, of Chester, was published in the Supplement to the *Mining Journal* of Feb. 13, and an opportunity of seeing it in practical use was afforded at an experimental working, which took place on the Thames Embankment on Aug. 6, conducted by Mr. H. SHEARER, of the Dalbeattie Granite Quarries, and Mr. W. G. FREEMAN, of the Penryn Quarries, in presence of a large party of the leading engineers, architects, and others interested in the progress of mechanical appliances. This invention is a simple and inexpensive application of machinery to imitate the action of the tool in the hands of a skilled mason. The main framing includes the bed-plate, on which the block of stone to be cut is fixed; with this are connected travelling arms, in which the cutter-stock, or cross-head (fitted with chisels, picks, and tools), is mounted. The arms and cutters are made to traverse the main frame from end to end alternately by means of screws. The journals of the cutter-stock are centred in eccentric bearings, which may be turned by levers, and fixed in position by stop-bolts. A lever is fixed to the stock, or cross-head, for giving right and left-hand cutting motions to the chisels or tools, as the case may be, this lever being coupled by a connecting-rod to the crank of a cranked shaft, centred in the centre of the travelling arms, and turned by a mitre-wheel. By taking out a pin the connecting-rod can be readily uncoupled, and the lever turned, so that it inclines in the opposite direction, for the purpose of reversing the direction of the cut. The main shaft has a long groove cut in it to receive a feather in the hollow of a short hollow shaft, turning in a bearing at the head of one of the travelling arms. The short hollow shaft is thus turned by, and traverses on, the main shaft from end to end, as the arms are moved backwards and forwards by the screws. The heads of the arms are connected by a parallel bar. Bevel wheels are keyed on to the ends of the screws, and are connected by a shaft carrying other bevel wheels. There is a ratchet wheel fixed on the upper screw shaft at the opposite end to the bevel wheel, whilst a lever centred upon the ratchet wheel, and fitted with a double or reversing pawl, is adjustable for turning the screws from right to left, or vice versa, according to the direction in which it is desired to work the cutter. A connecting-rod or link gives a rocking motion to the lever by the revolutions of a slotted crank on the main shaft. The crank-pin of this crank is on a hollow screw clamp, and by varying the position of the crank-pin the lever can be made to turn the screws more or less at each revolution of the main shaft, and thus regulate the feed.

In practice, the stone to be dressed is placed upon the bed-plate of the machine, with the side to be operated upon towards the cutters, and it is then fixed in position by the clamps and screws. The cutters having been previously moved to one end of the machine, and the cutter-head set to the required angle, the power is applied through the pulley to the main shaft, which then revolves, and the moving parts of the machine will be set in motion. If the block be tolerably quarry-faced, the surface operated upon will be cut nearly true by the narrow chisels at one traverse of the cutter-arms, and then by reversing the cutter-stock, so as to bring the broad chisels into play, the stone will be evenly tooled and finished on the back journey of the cutter-arms; by turning the block, the beds, faces, and joints may be dressed with truth and rapidly. By inclining the bed-plate or table more or less, any required angle may be given to the surfaces. Hence, when the machine is set to work, when the work is done, a number of blocks will be perfectly uniform, causing their beds and faces, or the angle of their surfaces to each other, to be perfectly true one with another. Thus, the use of square bevels and templates, &c., and the loss of time for setting out and working marginal drafts, as when dressed by hand labour, may be avoided. Where the stone requires a second or third rough chiselling before applying the broad tools, either the cutter-stocks can be made reversible, or the tools may be turned to clear the face, and the chisels run back. The tools can be made of almost any size, but Mr. Holmes considers it most convenient for ordinary purposes to make the cutter-stock give a cut 8 ft. wide, with a traverse motion of 8 ft., or so as to dress the surfaces of a block of any size up to 7 ft. in length by 3 ft. in width. For convenience of locomotion, the main frame may be provided with wheels, and, when necessary, a swing or travelling crane may be added to facilitate the operations of moving and turning the blocks of stone to and from and upon the bed-plate. It is claimed that, from the manner in which the tools act upon the stone, the motion is very similar to that given to them by hand labour.

The value of the improved machine for dressing granite is beyond question. Stone which has hitherto been so costly to dress, owing to its extreme hardness, as to be unworkable, can be dealt with in the machine with the utmost facility. The work is done by the machine in one-sixth the time occupied by hand labour, and the workmanship is certainly equal, if not superior. For hard stone the machine may be considered as perfectly perfect, and the very small amount of power required to work it is likely to secure its general adoption. Some of the softer varieties flake a little under the chisels, but it is probable that this difficulty would be readily overcome by varying the line of the chisels upon the cutter-stock, and giving the toggles a little more play. Thus, the chisels 1, 5, 9, &c., would be in one line, whilst chisels 2, 4, 6, 8, &c., would be a quarter of an inch further back; and chisels 3, 7, &c., in a third line; the cutting edges of all the chisels must, of course, be equidistant from the centre of the cutter-stock. By such an arrangement the rough chiselling would, probably, be even better than at present, and the broad cutter would at all times be able to finish the stone properly.

"JACOBSITE."—This new mineral was described to the Academy of Sciences by M. Damour as having been found by him at Jacobsberg, in the Nordmark (Sweden) in a bed of crystalline limestone, and associated with needles of white mica and small grains of native copper. It is crystallised in regular octohedrons, which are rarely complete, and generally deformed by the compression occasioned by their being crowded together. It is opaque and of a deep black colour, but exceedingly brilliant. When reduced to powder it is dark brown; it cuts glass, its density is 4.75, and it is strongly magnetic. It will not melt under the blow-pipe, and when heated in a platinum crucible it does not perceptibly lose any weight. When fused with borax it dissolves entirely, and produces a greenish yellow glass. A few particles of nitre added to the latter at an oxidising temperature changes its colour to a violet brown. When melted with carbonate of soda, it imparts to the latter the green colour which denotes the presence of oxide of manganese. It is insoluble in nitric acid; hydrochloric acid will dissolve it slowly but completely, with a slight evolution of chlorine. By analysis, oxide of iron is precipitated, and the remaining liquid contains protoxide of manganese and magnesia, the very small amount of which is easily separated from each other. M. Damour has effected this by dissolving the mixture of their oxides in nitric acid, by supersaturating the solution with ammonia. He then adds oxygenated water, whereby oxide of manganese is precipitated in brown flakes. The magnesia is obtained by evaporating the remaining liquid, driving off the ammoniacal salts by a moderate heat, and then calcining the residue.—*Galignani*.

LONDON GENERAL OMNIBUS COMPANY.—The traffic receipts for the week ending Aug. 15 was 10,639*l.* 1s. 4d.



## Meetings of Mining Companies.

## LUCY PHILLIPS GOLD AND SILVER MINING COMPANY.

An extraordinary general meeting of shareholders was held at the Guildhall Coffee-house, on Tuesday.

Mr. HERBERT E. ORMEROD in the chair.

Before the notice convening the meeting had been read, Dr. ASPLAND said he thought it extremely undesirable to allow a reporter to be present.

The CHAIRMAN said that no member of the board had any objection to the presence of a reporter—indeed, personally, he was very pleased to see one present, as absent shareholders would be afforded an opportunity of knowing what had taken place.

Mr. GETHING did not think it would be for the interests of the future of the company, and would act against the chance of continuance of the company, if what would probably take place at this meeting were published to the world; therefore, in the interests of the company, he would suggest that no reporter should be present.

Mr. AMOR, jun., objected to the presence of a reporter, as he knew very well there would be a great deal said that would be prejudicial to the company.

The CHAIRMAN could quite understand that those who were anxious to import personal matter into the discussion should object to the presence of a reporter; but he was strongly of opinion that it was bad policy to advocate concealment.—Dr. ASPLAND spoke in the interest of independent shareholders, when he urged the exclusion of the reporter. He was an independent shareholder, and had no connection with Mr. Gething, Mr. Amor, jun., or anyone who had been opposing the directors. He then proposed that the reporter should be excluded, which was seconded by Mr. GETHING.

Upon the question being put only two hands—the mover and seconder of the proposition—were held up in its favour. It was, therefore, lost.

The CHAIRMAN then called upon Dr. Bishop to make his statement.

Dr. BISHOP said: When in July, 1868, I accepted the arduous post of representative of the board of directors in Idaho, to investigate the affairs of the company, the position was as follows:—On the one hand, a certain mining property had been purchased of Mr. Matthew Graham, and other parties in America, which was set forth by the promoters of the company as follows (after stating that the company is established for the purpose of raising sufficient capital to develop what is believed to be one of the greatest, if not the greatest, mining discovery of the present generation, it is stated in the prospectus):—

"This mine (the Lucy Phillips) is situated on Atlanta Hill, and is one of the first ledges discovered in the above-named district. It is well developed, and the rock will average at least \$100 per ton; the facilities for working it are good, there being an abundance of wood and water, and a good mill site within 200 yards of the mine. The size of the ledge is 1000 ft. in length, by about 40 ft. in width." The prospectus containing the above description of the property, including the mill site, was issued in 1866, and was put forth, as stated therein, on the authority of gentlemen "of the highest respectability." Early in the year 1867, after some delay on account of sickness, Capt. H. James, a mining engineer, was sent out to examine the property, and report thereon. The following extracts are from his report:—

"Lucy Phillips Mine, Alturas County, Idaho Territory, May 18, 1867.—I visited this property on the above date in company with Messrs. Graham and Beckwith, and although the face of the country was covered with snow generally on the Atlanta Hill, and where the Lucy Phillips is situated, the snow was pretty well all gone off the ground. The length of the grant or claim is 1000 ft., or 166 fms. 4 ft., situated in the side of the mountain, rising at an angle of 45°, or nearly. These, the surrounding high mountains, are seldom clear of snow for more than four months in the year, therefore my great hurry for the machinery to be got over the mountains before the snow sets in again on them. At least 320 ft. from the summit of the Atlanta Hill, and from the eastern part of the set, a tunnel has been driven in the direction of the ledge eastward for 125 feet, and in about the centre part of the ledge, and at the present end of this drive, they have turned the tunnel north, towards the footwall of the ledge, and have driven 27 ft. in that direction, and not as yet discovered any footwall, therefore I think the breadth at least will be found 40 ft. From the eastern end of the set down to the foot of the hill, and where the stamps will be erected, is 3/4 mile, which will be very easy carriage. The quartz ledge is embedded in a soft quartzose granite, and the ledge itself is found exceedingly easy to work, and more especially after tunnels are driven to properly lay it open. The situation of the mill is everything that could be desired for the stamping and washing of the ore."

By previous arrangement, if Capt. James was satisfied with the property, he was to send a telegraphic message to that effect, which he did in the following words:—"Thoroughly good, you may go on, credit me 10,000, sterling for machinery and carriage through Horton." It appears to have been on the strength of this telegram, and without waiting for his report, that action was taken, the report itself being written from the captain's rough notes. In the meantime, however, the promoters of the company in England had handed over to the directors a letter addressed by Mr. Graham to Mr. John Horton, one of the promoters of the company in New York, calculated to increase the expectations of the shareholders very much; it is dated Rocky Bar, Alturas County, Idaho, December, 1866:—

"I advised you in my last of the receipt of your letter containing the prospectus of the Lucy Phillips Company. Friend John, I have never told you one half of what I think of the Lucy Phillips ledge, but as you have raised a company under such good prospects I will tell you for the first time something that I think will please you. I have expended on the Lucy Phillips Mine this winter \$6000, and having men on it night and day, for the purpose of getting it in good order, to show yourself and your London friends when they come out to look at it; and I am so sure of your being proud in being the getter up of the company, that I am in my power to tell you here this very night. Instead of the ledge being 40 ft. wide, I think it is near 100. My men struck it a week or two ago, and have run 40 ft. in it already; and, seeing yet no sign of getting through it, and striking the north casing, or hanging wall of the ledge; and there is enough quartz in sight to keep a 20 stamp mill running for five years; and, John, it is rich. I cannot describe it to you more fully, but hope the time is soon coming when you will be here to see it yourself, and this company, with ordinary management, cannot help but prove a brilliant success."

This statement of Graham to show the richness and size of the Lucy Phillips ledge was retailed by himself in person in London, at a meeting of the shareholders in February, 1868, in which he not only confirmed his previous statements, and Capt. James's report, but said he had, since James left, while tunnelling in another direction, found a rich ledge of black sulphurets, so rich and valuable that he covered it up to hide it from observation. As the shareholders who were present will perfectly recollect, he gave the description of the ledge as being in his *boya fides* by calling it a ledge of black sulphurets, and intended to sell his shares. Capt. James returned with Mr. Graham to Idaho—the former as manager with full powers, the latter as mining engineer.

To meet any possible contingencies Capt. James was supplied with a code to communicate by telegraph if anything went wrong at the mine. Early in July last the board of directors were suddenly thrown into consternation by the receipt of the worst word in the code, and they were the more alarmed as rumours had been for some time extant of our title to the mine being disputed. It was thought advisable to send one of our best men to investigate the matter, and if found desirable to go on to Idaho. I was selected for this mission, and in four days from accepting the post was on my way to New York, where I found a telegram waiting my arrival, requesting me to push on to the mine. A short time after my leaving England the directors received a report from Capt. James of a very extraordinary character, in which he unsaid everything in his first report as to the ledge; and, further, he said that the ledge had been taken to first report to England, and that the ledge had been tampered with, a copy of the report was immediately forwarded to me, and reached me in Boise City soon after my arrival there. On bringing Captain James and Mr. Graham together it was evident there had sprung up the most violent antipathy between them, James stating that Graham was the greatest deceiver under heaven, and using language I cannot report, each denouncing the other in the most unmeasured terms. James asserted that there really was no ledge at all in the tunnel, and no casing was found, and that the ledge was a fabrication, and that Graham had pretended discovery of black sulphurets, and that he had not adopted the mill site selected by them, about 3/4 mile from the mine, but one quite five miles away by the road, and by the nearest possible cut three miles off, which would require an outlay of \$8000 to \$10,000 to make; and what particularly roused his suspicions was that this new mill site had been recorded and located in Graham's own name, and not in that of the company or its trustees; and Mr. Willis very properly refused to allow the machinery to be deposited there, insisting on Graham executing a deed of conveyance of the same to the company. He also reported that there were at least two sets of claimants ready to dispute our title to the ground.

A further embarrassment was a statement by James, to the effect, that in consequence of his having spoken out as to the worthlessness of the property, he was in mortal fear of Graham, and in consequence I had great difficulty in persuading him to return to Yuba. Graham's statement was, as I previously reported—"Come to the mine and see for yourself; and, if you are not satisfied with Lucy Phillips, I have other good mines; I will give you the best of them." Further, he stated that he had already conveyed the company 200 ft. in a mine called the Jessie Benton, to atone for the captain's disappointment; also, that since Captain James suspended operations, he had at his own risk commenced sinking a shaft to strike the ledge (that is, find it), that he was certain it would be found by going deeper, and that when found it would be the Atlanta, and as rich as the Atlanta, &c., although it was distinctly stated in the prospectus the ledge was already discovered and developed. Now, it did not require much discrimination to detect at once the falsity of the statements made by him; but, as Captain James's conduct was utterly inexplicable, and, as I believed, if Graham had other good mining properties he might still get a *quid pro quo*, it was advisable to give him an opportunity. Accordingly, having promised to see Captain James properly protected, we all started for the mine, and on our arrival there found him wrong in his statements as to Graham having gone beyond his boundaries (but James declared Graham had changed the stakes), and also as to the direction of the set, not right as to there being no ledge, and that the contents of the tunnel were nothing but a mixture, as previously described, of decayed granite, white clay, and quartz. This was verified by many practical miners who visited the tunnel with me afterwards. We went down the shaft, then about 40 ft. deep, and took specimens of the material the miners were raising from it, and we also selected specimens from the little spurs of quartz found

here and there in the tunnel, and from the very spots where Captain James stated he took his specimens the previous year. These were submitted for assay by different persons—Mr. Perkins, assayer to the Greenback Co.; Prof. Liebenaut of Boise City; and Mr. Pierson, our own millman and assayer, and all with the same result, showing nothing more than a trace of precious metal. I had also assays made of the lode of black sulphurets reported by Graham, and in no instance found anything but sulphurets of iron therein. It is true that during our stay in the camp we got occasional good results from assaying fragments of rock obtained from the shaft and the drift; but it is a fact that in every instance these specimens were found by Graham, and this was one of the many statements made by Mr. Gething against him when they quarrelled in camp, and which admitted of no reply for it was true. The following letter from Prof. Liebenaut, who was selected by Mr. Graham, Mr. Gething, and myself, to superintend the assays and mill operations, was received Sept. 29, 1868:—

"Boise City, I.T., Sept. 29, 1868.—Dear Sir: I submit to you the result of my late investigations on the value of quartz taken from the Lucy Phillips claim, also my opinion of the ore taken from the Jessie Benton. The examination of the Lucy Phillips Mine, opened by a tunnel, one shaft, and two drifts, shows grey quartz of glassy appearance, as not gold nor silver bearing. The different strata of barren quartz are connected by decomposed granite. The assay of croppings show only traces of gold and silver, and would not pay for working. The most careful search for gold and silver bearing quartz, as I had assayed in this establishment here, showed me none in the claim. The tests made of ore from the gold and silver bearing quartz ledge, Jessie Benton, as taken from the dump at the mill and mine, show very different in their yield. The best sample of my selection yielded about \$60 to the ton in gold; Mr. Graham's selection showed \$386 in gold; the majority of the samples did not assay over \$10 a ton. To judge from the present appearance of the ore and ledge it is safe to say that the ore will not average \$20 to the ton, and that it will take further mining development to prove whether the ledge is extensive enough to supply a 20-stamp mill regularly with pay ore."

CHARLES LIEBENAUT, Mining Engineer, M.A.  
To Dr. Edw. Bishop, President of the Lucy Phillips Gold and Silver Mining Company, Yuba City, I.T.

The shareholders who have taken the trouble to watch the whole history of this affair need not be reminded that after sinking the shaft 10 ft. and then drifting in several directions according to the advice of Capt. James and Mr. Graham, we did not succeed in finding the lode, nor is it necessary for me to state how, in accordance with my instructions, several tons of the quartzose material (the best looking being selected for the purpose) was operated on in a stamping mill, in order to leave no step untried to test its value; how we had assays made continually, so as to guard against fraud, and that these assays never gave more than a trace of precious metal, and how eventually a coarse fraud was detected upon us, by assaying the pulp (making the ore) in the pans and the settlers, which, if not detected, would have involved the English shareholders in still further loss, as it would inevitably have led to our immediately extending fresh capital on Lucy Phillips's property, giving all the time a fictitious value to the shares of the company. While on the subject of Lucy Phillips's property (and before speaking of the Jessie Benton) it will be proper to refer to the claims said to have been set up against us. On reference to my report of November last, it will be found that up to that date no notice of claim had been taken, and that second a better title than the title taken by Capt. James and Mr. Graham on this subject, I wished to have someone on the spot to consult as to the title, I employed Mr. (commonly called Judge) Anderson to investigate it, and he was assisted in doing so by Mr. Gething. At the end of their examination of the record they both informed me the title was good, and I instructed Mr. Anderson to prepare an abstract with his opinion, and to have it ready for me on my return from Yuba through Rocky Bar, that I might append it to my general report. In giving me this abstract and opinion, Mr. Anderson informed me that he had a better title than the title taken by Capt. 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give the shareholders any mine they ask for, or any two or three mines.—Mr. GETTING: If he takes my advice he will leave himself in the hands of the shareholders until after the present directors have resigned.

Mr. GRAHAM: I am perfectly willing to leave myself in the hands of the shareholders, provided you get rid of the present board and go ahead like men.

The CHAIRMAN: Is it true that at the time this prospectus was issued the Lucy Phillips Mine was well developed?—Mr. GRAHAM: Yes, Sir.

The CHAIRMAN: Had the lode been found?—Mr. GRAHAM: I still claim it as a big lode; a tunnel was run through a body of quartz.

The CHAIRMAN: What sort of a lode?—Mr. GRAHAM: A quartz lode—gold-bearing quartz. You never laid enough money out to reach your walls.

Mr. GETTING: Is it on the Atlanta, and have you had it surveyed by a professional mining engineer?—Mr. GRAHAM: Yes; I have had it surveyed by Mr. Slater, who gives it as his opinion that it is on the Atlanta.

Mr. WEBB: Have you a lode without casing walls?—Mr. GRAHAM: You have never got outside the body of quartz to reach the casing walls.

A SHAREHOLDER: How does Dr. Bishop account for the great discrepancy in the assay of the quartz?—Dr. BISHOP: Whenever I made an assay, or was present at an assay, it was always poor; but when Mr. Graham brought in specimens to be assayed they were always good.

Mr. WEBB: A very significant fact.

A SHAREHOLDER: The question is, will Mr. Graham give these mines to the Lucy Phillips Company?—Mr. GRAHAM: I will not give them to a board of directors who are interested in another company that wishes to destroy the Lucy Phillips Company. If you gentlemen resign I will at once give them to the shareholders.

The CHAIRMAN: We have no intention of resigning. (Loud cheers.) We have a duty to perform as directors, and we should be neglecting that duty if we retired from office and allowed our places to be filled by persons selected by the vendor or his friends. This is what Mr. Graham and Mr. Getting desire. The offer which Mr. Graham made in his circular of the 9th inst. was to give fresh mining property to the company. It was an unconditional offer, otherwise the directors would not recommend the shareholders to accept it. Is Mr. Graham anxious to retract it? If to-day he departs from his undertaking of last week, we have no security that he will not depart to-morrow from his undertaking of to-day. (Hear, hear.) Under these circumstances, I repeat that we have not the slightest intention of resigning. (Cheers.)

The resolution that Mr. Graham's offer made in the circular of Aug. 9 should be accepted unconditionally was, therefore, put and carried unanimously.

Colonel WEMYSS then proposed the election of Dr. Bishop as director in the room of Mr. Griffiths, resigned. All, he thought, would agree with him that the personal experience obtained by Dr. Bishop in the territory would be of considerable benefit to the board.—Mr. TILDESLEY seconded the proposition, which, upon being put, was carried by a majority of 25 to 15.

Mr. GODFREY then moved that the board resign.

Mr. MURRAY was sorry he felt it his duty to second that proposition. He thought it was a wrong step for the directors of this company to become directors of a competing company, and it appears that the parties selling this Minerva Mine have an antipathy to Mr. Graham, as Mr. Graham has to them. He felt bound, therefore, to second the proposition, asking the present directors to resign.

The CHAIRMAN said he had just taken the sense of the meeting as to the election of Dr. Bishop to a seat at the board, and the meeting had by a large majority elected him; but the very next proposition was that Dr. Bishop and the other directors should retire, the whole being really directed against Dr. Bishop. The meeting had substantially expressed its confidence in the board.

Mr. DOMMETT (the solicitor) ruled that as the present was an extraordinary general meeting, convened pursuant to notice, only such business as that embodied in the notice could be transacted. One of the objects of the meeting was to elect a director, which had been done.

The CHAIRMAN said that some remarks had been made as to the members of this board having joined the Yuba Company. As that reference had been made, he might take the opportunity of stating that the Yuba Company had given a preference to the Lucy Phillips shareholders, and simply because the Yuba Company was promoted entirely in the interest of the Lucy Phillips Company, for, however rich the Yuba district may be, it was quite clear that the Lucy Phillips Company could not do much, being so heavily weighted by the large amount of dead capital in the shape of vendors' shares.

A vote of thanks was passed to the Chairman, and the proceedings terminated.

[For remainder of Meetings see to-day's Journal.]

#### FOREIGN MINING AND METALLURGY.

There is no material change to report in the Belgian coal trade. The forgers continue to carry quotations upwards; a Liège establishment is understood to have advanced its quotation for rolled-iron to 77.4s. per ton. The state of the Belgian iron market has very greatly improved during the last few months; a large part of the production of the rolling-mills is engaged beforehand, and the demand for merchants' iron is active; all these would be serious elements in a further advance if they were checked by the competition of the English market. At Charleroi pig for rails is quoted at 21. 12s. per ton, and fine-grained pig at 31. 4s. per ton. The price of pig for castings is kept down by English competition. The construction workshops of Belgium are now well employed. The Eastern of France Railway Company has established, as regards the conveyance of iron in bars, a special tariff from Givet to Bâle. Certain extraordinary expenses attending the erection of a church and school have occasioned a deficit in the budget of the town of Charleroi; and to make it good, the communal administration has decided that collieries, mines, mineral bearings, quarries, and industrial or commercial enterprises, shall pay an annual tax of 2s. 6d. for each person employed of either sex; all undertakings employing less than 15 persons are, however, to be exempted from the proposed tax. The establishment has been authorised of a concern to be known as the Bray-Maurage and Boussoit Collieries Company. The office of the company is to be at Maurage, and the share capital is to be 100,000l., represented by 5000 shares; the capital may be increased to 1,000,000l. by the decision of the Committee of Administration. Obligations may also be created by a decision of the General Council, but only to the extent of one obligation (calculated at the rate of re-payment, 20l.) for two paid-up shares. The principal objects of the company are defined as follows:—First, the working of coal mines in the commune of Bray-Maurage and Boussoit, and the total or partial acquisition of other collieries in Belgium; and, secondly, the production and sale of coke and other products derived from coal. The Bray-Maurage and Boussoit Mines were conceded to Charleroi by the transfers of the collieries and the proprietorial rights, together with about three acres of land. In consideration of the transfer, M. Chandon is to receive at par 3600 shares, liberated to the extent of 8l. each. The financial service of the new company is to be carried on by the Belgian General Company for Encouraging the National Industry. The first directors are to be Baron Goffinet, MM. Adolphe Benoit Bruneau, Jules Lejeune, Jules Malou, and Leon Orban.

The entry into Paris was officially noted in June of 5147 tons of iron and 1700 tons of pig and castings, against 5047 tons of iron and 1595 tons of pig and castings in June, 1868. In the first six months of this year the entry into Paris was officially noted of 22,790 tons of iron and 8460 tons of pig and castings; the totals for the corresponding period of 1868 were 20,482 tons of iron and 8441 tons of pig and castings. The general state of the French metallurgical markets may be summed up in the words, firmness of prices and abundance of orders. An upward tendency has been recognised in the East of France, where the pig and iron markets are the influence of more remunerative prices the French works are not only increasing the amount of their production, but also their means of production. In proof of this assertion we may state that one important establishment in the East of France is now constructing twelve new puddling furnaces; and that two other establishments—one belonging to the eastern group, and the other to that of the centre—are also erecting blast-furnaces of very considerable height, 60 ft. to 80 ft. Charcoal-made pig is quoted in the Hauts-Alpes at 41. 3s. 4d. to 41. 4d. per ton; mixed pig, 37. 7s. 2d. to 37. 8s. 10d.; and coke-made pig, 39s. 2d. to 37. 8s. per ton. Rolled puddled iron from charcoal-made pig has brought 81. 16s. to 81. 4s. per ton, according to the works, and according, also, to the importance of the contracts offering themselves. Rolled puddled iron from mixed pig has made 81. 12s.; and ditto from coke-made pig, 81. 4s. to 81. 8s. per ton (first class). Sheets have brought 91. 12s. to 101. per ton (first category); hammered iron, 91. 12s. to 101.; and axle, 91. 6s. to 101. 4s. Machinery for the production of charcoal-made pig has brought 91. 12s. to 97. 16s. ditto from mixed pig, 81. 16s.; ditto from coke-made pig, 81. 8s. The Guignicourt works, in the Ardennes, have been sold by private contract; a public adjudication announced for the 23d inst. will, consequently, now not take place. The demand for rough pig has been sustained pretty well in the Meurthe and the Moselle, and has been dealt in at 27. 15s. 2d. to 27. 16s. per ton; the old contracts are being brought to a close, and the question is beginning to be debated whether there will be renewed on the same conditions. This would appear to be a matter of some difficulty, as the scale between the old prices and those now current is too considerable. The forges continue very actively employed. We stated on a previous occasion that a railway was in contemplation from Longwy to Esch; another project has, it appears, been started by a Belgian company, and may, possibly, be carried out. We refer to a line from Viron to Esch, which would effect a junction with the Ardennes network near Vezel. The Arrière Metallurgical Company has contracted to supply the Indret maritime establishment with 300 tons of superior iron, to be used in the manufacture of heavy pieces of machinery; a similar contract was entered into in February, 1869, by the Arrière Metallurgical Company on the same terms. The concern known as the Compagnie des Chantiers de la Seine has been charged by the Ottoman Government with a colossal work—the construction of an iron bridge 6000 feet in length by 100 feet in width, which is intended to be thrown across the Golden Horn to unite Stamboul to the suburb of Galata. If we are rightly informed, the new bridge will rest on 46 boats, moored at a distance of 133 ft. from each other, and at some points it will open, when necessary, so as to admit of the passage of ships of war entering the arsenal. The annual meeting of the Carmaux Mines Company showed that the profits derived from working in 1868 amounted to 32,792l., while the fixed charges of the year were 8782l., leaving a balance of 24,010l., to which was added the reliquat of 2081l., which was brought up from the year 1867, thus making altogether a total balance of 26,091l. available for dividend. The dividend for 1868 was fixed at 17. per share, absorbing 23,199l., and leaving 2892l. to be carried forward to the credit of 1869. In October, 1868, the Compagnie des Mines Company determined on a loan of 6000l. for the formation of an establishment for the production of agglomerates at Cransac. The loan was subscribed by the shareholders, and the works commenced operations in February; the cost of construction did not exceed 3400l. The new establishment is expected to secure considerable advantages; it can easily produce from 15,000 to 18,000 tons of briquettes annually. To absorb the production some local contracts have already been concluded, and the Orleans Railway Company has also undertaken to take off 6000 tons per annum. As regards the general results of 1868, the Council of Administration directed all its efforts to the discovery of new outlets. The feebleness of the demand for the company's products has reduced the sale prices, but the cost of production was also notably reduced, so that it is expected that the production of 1869, which is estimated at 84,000 tons, will be attended with more satisfactory results than those secured for 1868. The balance of profit available for dividend for 1868 was 2227l.; this would have admitted of a dividend at the rate of 16s. per share, but the shareholders agreed to forego a dividend, and to apply the available balance to the reduction of the floating debt.

As regards the foreign metal markets, we may note that copper has

displayed little change. The same may be said of tin; the Amsterdam market has been very inactive, especially as regards Banca. In lead there is no change to record. Zinc has been a little firmer, but the difference in prices is very slight.

#### FOREIGN MINES.

St. JOHN DEL REY.—The directors have received the following report, dated Morro Velho, July 17:—"Morro Velho produce for June, 11,408 oits., from 4649 tons of ore, yield 2453 oits. per ton. Morro Velho cost for June, 3899l.; profit for ditto, 517l. Morro Velho, produce 11 days of July, 2771 oits., yield 751 oits. per ton. Gala produce for June, 780 oits., from 940 tons of ore, yield 824 oits. per ton. Gala cost for June, 412l.; Gala loss for ditto, 78l. Gala produce eleven days of July, 220 oits., yield 736 oits. per ton."

DON PEDRO NORTH DEL REY.—Mr. F. S. Symons reports the produce for June, 14,077 oits., at 8s. 6d. per oit., amounting to 5982l. 14s. 6d.; and the cost 2844l. 8s.; showing a profit of 3138l. 6s. 6d. He adds that "although no box work has been taken out, and a limited amount of our richest ore taken from bottom and richest stops, owing to increase of water, still we are enabled to show a profit on the month's operations of upwards of 3000l. Attendance of force has been fair; percentage of sick not high; a splendid supply of timber &c. brought in; the work on the new lode we have opened it to be of most satisfactory size, though not at present so auriferous as we could wish. The results to the first six months of 1869 will, I hope, be thought first-rate by both directors and shareholders, as not only have we been enabled to declare profits amounting to upwards of 35,000l. sterling, but a new auriferous lode has been discovered." First Division of July.—Extracts from Mr. Symons' letter, dated July 17:—"Produce cleaned to date, 4318 oits. I am sorry to report so small a produce, but our stops on Canoa in underlie lode have given poor work, those on Curva have been effected by the hard channel of ground in shaft, and no box work taken out. But though I have to announce such a poor return I have great pleasure in reporting an improvement in sump-shaft, and an auriferous run of ground appearing in bottom. Yesterday the captains reported the change, and to-day I sampled the ground myself; every sample was auriferous, and one was rich enough for box work, so that we may confidently look for an improvement when stops reach this horizon. Water is being kept more satisfactorily than in last month. Man-engine answers well; work in connection with horse-engine has been set about. Little change has to be noted in our lode; exploration east has demonstrated that in depth it has improved a trifle. The works, a deep adit, Treloar's level, and Vivian's shaft are progressing apace."

CHONTALES (Gold and Silver).—The directors have received advices from Mr. Belt, under date July 8. Gold sent by this mail 502 oza., from 1522 tons of ore; average yield, 6½ dwts. per ton; cost, 1500l. for the month, including 276l. extraneous payments, forming no part of working-sheet. The heavy floods have necessitated the suspension of all works at the Consuelo Mine, except the deeper workings. The San Antonio Mine is opening out satisfactorily in the deeper workings. The Consuelo Mine is improving, and the general prospects in the lower mines are much more encouraging. The health of the establishment is unusually good. Mr. Belt adds:—"We shall be able to work our stamps six months in the year by water-power, and thus save wood. We are, therefore, pushing on the work for connecting the water-wheel with the stamps, and have finished the necessary excavations, and are now busy with the framing. Both our east and west ends of No. 5 level at San Antonio have been driven 190 ft. in the last month. The eastern end is now 9 dwts. per ton, and the western end is worth 6 dwts. per ton. The deep adit level has been driven 10½ varas, with a lode 5½ ft. wide, and worth 6 dwts. of gold per ton—altogether San Antonio Mine is looking exceedingly well. At Consuelo Mine heavy floods have loosened the old ground, which has crushed the No. 3 level, and it has become quite impossible to carry on any works in it. I have suspended all work at this mine, except driving the deep adit.—Trinidad Mine improves as we get further into the hill, and can be worked with great economy; and, considering that our present reliance is entirely from the lower mines, and that we appear to have large quantities of similar ore, the result is encouraging. Notwithstanding the Consuelo Mine has been unproductive during the past month, and extraneous payments made amounting to 276l., we have nearly covered the total expenditure, and should all go well, we hope to do considerably better."

Santo Domingo and Trinidad, June: Santo Domingo: During this month No. 5 level, in back of No. 3 level, east of old shaft, has been driven 14½ varas, yielding 12 dwts. of gold per ton. No. 4 stop, in the back of No. 3 level, west of Santo Domingo old shaft, has been stopped 12½ varas, yielding 10 dwts. of gold per ton. No. 5 stop, in back of No. 3 level, west of Santo Domingo shaft, has been stopped 11½ varas, yielding 10 dwts. of gold per ton. No. 3 stop, in back of No. 3 level, east of old shaft, has been stopped 2½ varas, yielding 9 dwts. of gold per ton. No. 4 stop, in back of No. 3 level, east of old shaft, has been stopped 4½ varas, yielding 12 dwts. of gold per ton. No. 5 stop, in back of No. 3 level, east of old shaft, has been stopped 4½ varas, yielding 12 dwts. of gold per ton. No. 6 stop, in back of No. 3 level, east of old shaft, has been stopped 3 varas, yielding 15 dwts. of gold per ton. We have suspended those stops for the time, they being so near surface, and the heavy rain we get at this season of the year makes it difficult and expensive for working; nevertheless, I believe there are more pillars to be taken out near the surface as soon as the weather gets a little settled.—Trinidad: Trinidad level has been driven 4½ varas, yielding 12 dwts. of gold per ton. No. 5 level, in back of the above level, the lode averaging from 4 to 5 ft. wide, and yielding 5 dwts. of gold per ton. The Trinidad lode appears to be improving in the end and stops going east. Although so many of our Englishmen have left, we have suffered nothing from their leaving, as many of the native miners are able to timber their ground without the assistance of Englishmen. Quartz sent to mill 2½ ft. wide, 9 dwts. of gold per ton. A rise in back of the deep adit level, has been driven 13 varas; this rise is to ventilate the deep adit level, and to enable us to fill up with clay the stopes from the surface. The quantity of ore sent to the stamps for the current month is 680 tons, which I estimate at ½ oz. per ton; in all, about 227 oza. of gold.—JOHN TONKIN.

Consuelo and Estrella, June: I beg to hand you my report of the above-named mines for the current month. No. 4 deep adit level, on the course of the lode, has been driven 4½ varas; no change in my last report. No. 3 level, in back of No. 4 level, has been driven 4½ varas, and now suspended. No. 2 level, in back of No. 3 level, during the wet season, as it is almost impossible to keep the old levels open. When the deep adit level reaches this point it will form a new working, and the mine cannot till then be worked advantageously. We have suspended on the back of the lode about 80 varas east of the old workings, which is showing a lode varying from 2 to 4 feet wide, containing a little gold, but not to value.—JOHN TONKIN.

ROSSA GRANDE (Gold).—Mr. Ernest Hileke reports the produce for June amounted to 852 oits. of gold.—Gongo Soco: The operations of the western exploration have been carried on steadily. During the month a small produce of 60 oits. of gold has been derived from the old mine.—Mina de Serra: The size of the lode at our main points of operation has become smaller, and has not yielded so well as previous month. Its average percentage of gold is 10½ dwts. per ton, whereas in the previous month it amounted to 10 oits.; 13½ oits. have been extracted from the mine, which yielded 695 oits. of gold.—Bahia Mine: A small force has been employed at the old workings, but the disadvantage in drawing the ore to surface and the increase of water will oblige us to suspend this place. The mining captains recommend re-opening the main Bahia Mine, and to sink an engine-shaft at the deepest point for unwatering same; this, therefore, will be put into execution." First Division of July.—Extracts from Mr. E. Hileke's letter, dated July 16:—"With regard to the mines both here and at Gongo, little of note has presented itself to call for particular attention. We find our supply of water diminishing considerably, owing to the little rain we have had this year. So far, however, we have sufficient for our present purposes, but I fear this will not be the case for August and September."

TAGUAREL (Gold).—Mr. T. S. Treloar, July 15:—"Our operations, taking into consideration the frequency of holidays and unstable nature of the force, have progressed satisfactorily, and fair duty has been accomplished both in and out of the mine. The work connected with the pumping machinery is being prosecuted with all the means at our command, and no effort will be spared in the endeavour to have some sufficiently advanced to enable us to begin pumping water from the mine some time in November next. A plentiful supply of native materials for building and other purposes has been brought in. Measures for obtaining the force adequate to our requirements are being adopted."

SAO VICENTE.—At Phillips' shaft (rock formation) we have not sunk so much during June as I could have wished, owing to our having had to devote some time to secure some weak ground in the mine, and also to replace the working back of the sinking-shaft, which was accidentally broken when working on the 8th. We have adopted means to more effectually protect this barrel in future. The lode is still, I am sorry to say, very small, and much intermixed with killas. I hope we shall have nothing to impede our sinking this month (July), as I am anxious to ascertain if the lode will again make in depth. At the Jacotinga works have progressed favourably, but nothing has been met with calling for special remark. Our water-power, owing to the long and cold of the month, has been somewhat deficient, and we have, therefore, been obliged to stop the former; the stuff broken in sinking will be allowed to accumulate till the water increases.—First Division of July (July 17): The works here and at the Jacotinga formation are progressing with regularity. At Smith's cross-cut (Jacotinga formation) we have encountered a layer of canga, which is very tight for driving, consequently the progress for the time is slow. I do not think it remains so long. There is on change of note in the lode at Phillips' shaft (rock formation)."

GENERAL BRAZILIAN.—Messrs. John Moore and Co., the company's agent (July 1) advise that the title deeds had been examined by their lawyer, who had reported that they were all in order; that the purchase might at once be concluded; that the deed of transfer was being prepared, and that it would be ready for signature by the time Captain Treloar reached Rio. Messrs. Moore and Co. at once communicated with Captain Treloar, and under date July 23 they write that Captain Treloar would be in Rio in about ten days to complete the purchase.

ANGLO-BRAZILIAN (Gold).—Mr. F. S. Symons reports the produce for June amounted to 2609 oits., or 1178l. 12s.; and the cost to 1927l. 15s. 3d.; showing a loss of 129l. 3s. 3d. He adds:—"The loss, I am pleased to say, is less than in May. Every effort is being made to keep down the cost to as low a figure as possible consistent with efficient working. Force has not been up to

the average, several of the natives having gone to their homes for a time, but will return. The sick list has been very favourable; no death has occurred, and though the total produce does not equal that for May, yet per working day it is the same."—First Division of July: Extracts from Mr. F. S. Symons' letter, dated July 17:—"The works are progressing with regularity, and there is little alteration to note in the appearance of the lode. Foster's (west) is very changeable, but we hope that beyond the cross-course we shall have better stone. The size of the lode at Dawson's shaft is most encouraging, as is that at the deep adit. The supply of stone from the mine is superior to our stamping power, owing to deficiency of water; we cannot hope for an increase for some time."

JAYALI.—The whole of the new machinery was set to work on June 23, and had been working without any serious hitch till the departure of the mail on July 5. There was 433 oza. of amalgam on hand, which, together with the month's yield, would be forwarded next mail. The Nispero shaft had been well timbered, and the tunnels driven ahead. "Pollock's Tunnel," writes the manager, "will pass in future through the pillar of the richest quartz that is standing between levels 7 and 8 of the Socorro. I think from here we shall get good ore, as there are but two winzes in the bottom of levels 7 and 8, the balance being virgin ground, and very rich." The health of the mine and district continues excellent, and as yet no inconvenience had been experienced on the Atlantic side from the revolt which has taken place on the Pacific side of Nicaragua. As was the case last month, no bills were drawn, nor would any be next month. Working expenses of the month of June, 320l.

NEVADA FREEHOLD PROPERTIES TRUST.—The trustees are in receipt of a communication from Nevada relating to the mines of this Trust. Judge Douglas, of Austin, on his return from a survey of the Twin River and Manhattan districts, writes of the Vanderbilt Mine, dated July 12:—"I was amazed at the yield of that famous ledge. In fact, there is such an amount of ore ready for milling that a mill might be kept going for four years; and the assays recently made fully confirm those made by Theall and Co., of this city, some time since." He further speaks of the mines of this Trust in the Manhattan district in the highest terms as of equal value with those in the Twin River district.

[For remainder of Foreign Mines, see this day's Journal.]

#### BRITAIN'S METAL MINES.

The importance from a national point of view of encouraging the systematic and thorough development of Britain's Metal Mines has been so frequently urged both in the *Mining Journal* and in the works of private writers, that it would appear to be a somewhat difficult task to furnish anything particularly interesting, and, still more, anything possessing novelty, yet in the admirable little volume,\* just issued by Mr. J. R. PIKE as a fourth edition of his now well-known book, but which, in fact, has been so materially enlarged and modified as to entitle it to consideration as a new work, there will be found a fair proportion of new matter and of attractive reading. Every statement made is concise and to the point, the author observing that the practical value of information must be regulated by its intelligibility, and keeping this circumstance in view throughout. He remarks that the minerals of copper, tin, and lead have been found throughout the length and breadth of the land, and that the amount of capital employed in the prosecution of this industry may be estimated at little short of 5,000,000l. sterling, continuing, after giving the statistics of capital, dividends, &c., of various mines—

"The average rate per cent. of profits on the market prices of shares is about 15, principally ranging from 10 to 20 per cent., and occasionally above and below these figures. Of course, as far as dividends are concerned, the original shareholders have the greatest advantage, as the profits realised from any mine not only being adjusted to the subscribers' capital in the undertaking, but the market value of the shares, in the great majority of instances, represents an enormous premium on the capital invested. With such results as these, at all times demonstrable, it may appear marvellous that any advocate of British mining should have cause to complain of indifference on the part of the investing public, seeing that the merits of coal and iron mines are so generally appreciated; such is, however, undoubtedly the case, and the only way in which the writer can reconcile the incongruity is by supposing the public to be ignorant of the true nature of the distinction between a Joint-stock Company and a mining enterprise, and a cost-book company. The latter system will be fully explained in another chapter; but it may suffice here to state that when coal and iron ore are not in private hands, it is usual to carry on the operations by means of Joint-stock Companies, with subscribed capital of large amount; whilst in mining for metallic minerals it is customary to subscribe the capital as it is required for the purposes of the mine, so leaving the amount of the shares undetermined."

In the same chapter, Mr. Pike points out the considerable ability in meeting an objection very frequently advanced by parties as an excuse for declining to embark in mining enterprise—its speculative character; the term "speculation" being used as a synonym for haphazard. He holds that it will bear favourable comparison with any ordinary business adventure, and compares the case of the miner and the cotton spinner, or the merchant, enquiring who shall say that such speculation is not only legitimate, but absolutely necessary in the interests of trade; and we entertain the hope that a perusal of the book may lead many individuals, hitherto unacquainted with this particular branch of enterprise, to add British mines to their list of investments for the profitable employment of capital and time."

In dealing with the question—Does British Mining Pay?—he gives a selected list of nine mines, assuming them to be purchased at one date, and disposed of nine months after, and shows an increase in the value of the monetary possessions of the investor of nearly 30 per cent. in the most unfavourable case; and quoted; in most of them, per cent.; and in one as much as nearly 400 per cent. profit. He very truly says that "when a mine pays, it pays well—so well, in fact, as to enable the holder of a few good shares to speculate in progressive mines without inconvenience. In some good mines the rate per cent. on the paid-up capital of annual profit is something enormous, and in all is large; whilst the annual rate of profit on market prices is certainly far above what can be obtained on any other class of security whatever."

Mr. Pike's chapters on Geological and Mineralogical Characteristics, on the Mines of Cornwall and Devon, and on the Mines of England and Wales (Cornwall and Devon excepted), Scotland, Ireland, and the Isle of Man, as well as those on the System of Raising, Dressing, and Selling Ores, on the Stannaries Court and the Cost-book System of Management, and on the Stannaries Court and the Companies Act 1852, are each interesting and useful; but they are already so concise as not to admit of abstracting, and the reader must therefore be referred to the work. There is an observation, however, in his concluding chapter which is worthy of extracting; he remarks that "The rapidity with which intelligence is conveyed from the various mining districts has effected a great change in the condition of the share market, by reducing the frequency of sudden and extreme fluctuations, the principal brokers and dealers are in constant communication by telegraph with the counties of Cornwall and Devon, they are consequently well informed of all that is going on in the mining centres, the benefit of which is naturally reflected on their clients." In dealing with shares in progressive mines, decision of character in the holder is at times a most valuable quality; some courage is necessary to withstand the temptation to sell shares in a mine when unfavourable symptoms have been suddenly manifested; but the fact is indisputable that in exact proportion to the coolness and deliberation displayed in such trying circumstances will be his success. The counsel we would offer to investors in such cases is to divide their mines, to ascertain, in the first instance, the extent of their available and probable resources. In progressive mines, to be careful in selection, and to hold through good report and evil report with discriminating firmness. For a very trifling fee any person can have a mine inspected by the courtesy of a shareholder; and should such an inexpensive precaution be neglected, and loss result from precipitate sale or purchase, no blame on this account can possibly attach to mining as an industry."

The work contains a vast amount of information, which appears to have been obtained from reliable sources when the author could not supply it from his own extensive experience, so that the volume will be valuable to investors and capitalists generally.

"Britain's Metal Mines." Fourth Edition, revised and enlarged. By JOHN ROBERT PIKE. London: The Author, Crown-chambers, Threadneedle-street.

READY RECKONER FOR THE COAL TRADE.—An elaborate and very useful set of tables,\* intended for the use of coal filters, agents, merchants, shipbrokers, captains, and others connected with the coal trade, has just been completed by Mr. ROBERT ROWELL, of Bridge End, Gateshead-on-Tyne, and will, no doubt, be generally adopted. The tables comprise calculations of the value of quantities of coal in cwt., to 3000 tons, at prices from 3d. to 20s., and annexed to each total is the amount which would be payable upon it for discount, brokerage, or commission, at 5, 2½, or 1½ per cent. Thus, suppose 1500 tons of coal be sold at 15s. 3d. per ton, it is found by a glance at a single table that the price of the shipment is 1143l. 15s., and that 57l. 3s. 9d., 28l. 11s. 11d., or 14l. 5s. 11d. respectively are payable for commission, &c., according as 5 per cent., 2½ per cent., or 1½ per cent. has been agreed upon. Mr. Rowell's tables are so arranged that there is a sufficient guarantee that the tables have been prepared with the utmost care, and as the fractional parts of a penny are not generally recognised in business, the system which obtains in custom houses, banks, and other commercial establishments (that of reckoning a halfpenny and upwards as a penny, and neglecting anything under a halfpenny), has been adopted in every calculation; and each calculation is independent in itself. And as it is not alone with regard to coal that the cost of freight or discount on cargoes, commission on freight, &c., has to be calculated, it is probable that the tables will come into general use for calculating the value of such articles as soda, muddle, ironstone, and almost innumerable goods constantly bought and sold at prices included in the book. The work will be a useful addition to the counting house library.

\* Coal, Freight, Commission, and Discount Tables." By ROBERT ROWELL, accountant. London: Longmans, Paternoster-row. Newcastle-on-Tyne: M. and M. W. Lambert, Grey-street.

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